Delaware Electric Generation Multi-Pollutant Regulation Development

Meeting #5

June 6, 2006

Agenda

- Goal and Reasons for Regulation
- Thoughts on Information Presented
- Proposed Multi-P Requirements
  - Pollutants Covered
  - Affected Units
  - Control Requirements (NO_X, SO_2, Hg)
- Related Initiatives (CAIR, CAMR, Haze, RACT, RGGI)
- Regulatory Development Timeline
- Next Meeting

Goal of Regulation

To require a significant reduction in air emissions from Delaware's coal and residual oil fired power plants.

Reasons For Regulation

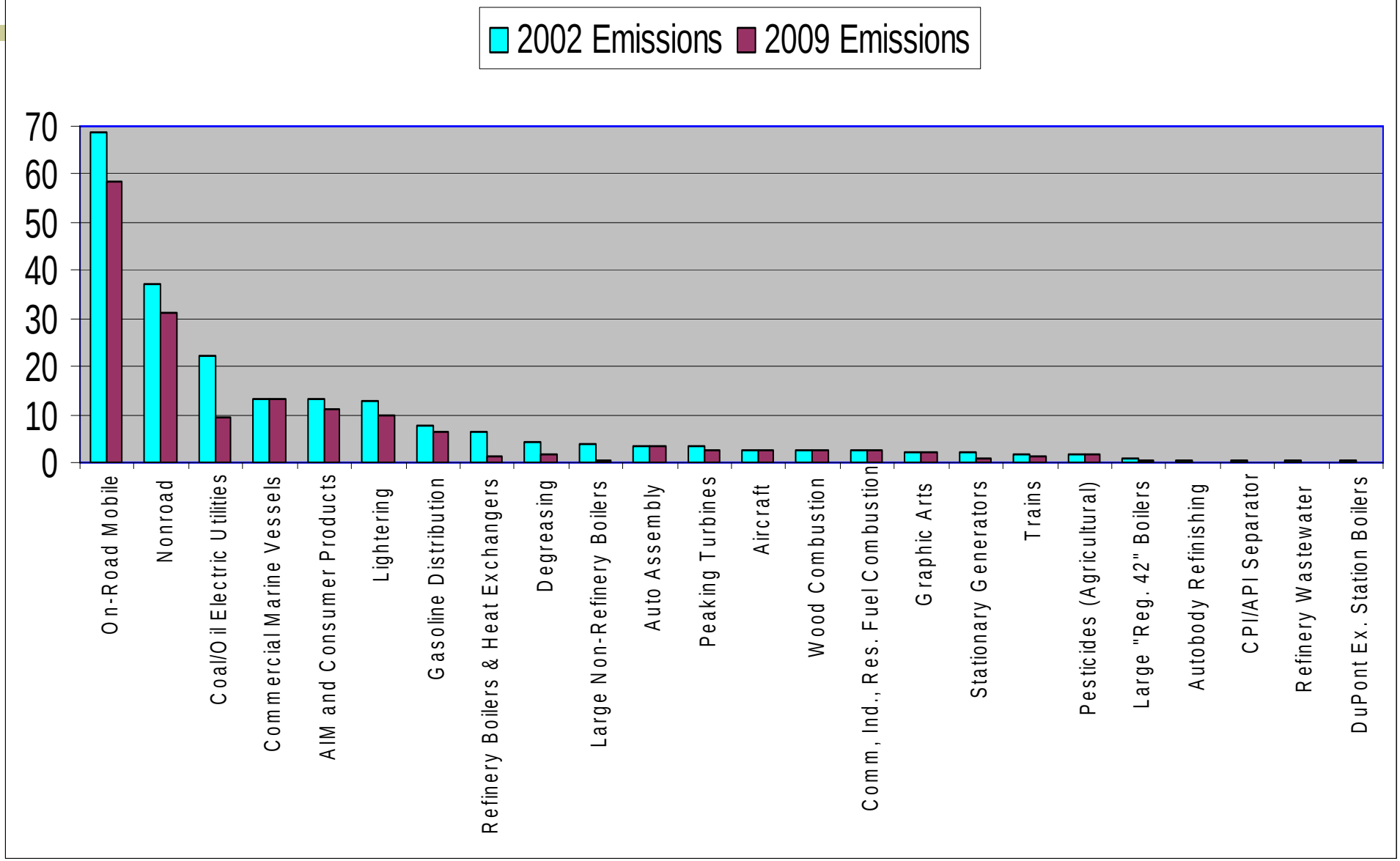
- Reducing emissions from Delaware's power plants will benefit public health, safety, and welfare at a reasonable cost:
  - Largest emitters (1st and 2nd) on the Toxics Release Inventory (TRI).
  - Contribute to ozone and fine particulate matter non-attainment.
  - Proactive step to address new particulate matter standard.
  - Reduce mercury contamination and nitrogen deposition to the Chesapeake Bay and Delaware's inland bays.
  - Reduce acid rain.

Reasons For Regulation *(cont'd)*

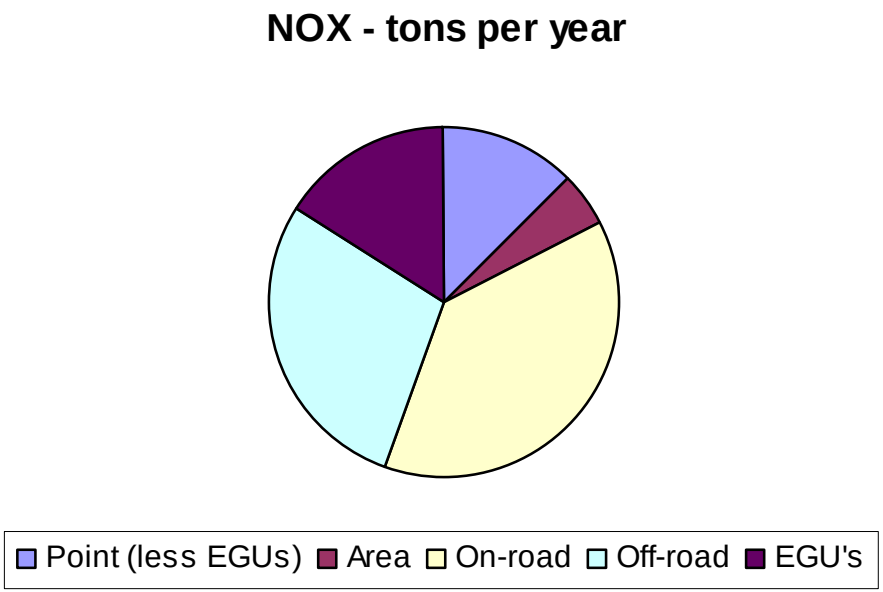
- Aid in achievement of regional haze goals.
- Reduce any local health impacts near the plants.
- Level the field with surrounding states
- Without this action mass emissions from Delaware's power plants will likely not decrease.

POST 2002 DE Control Measures	NOX	SOX	VOC	Primary PM
Stationary Sources				
Power Plant Multi-Pollutant	X	X		
Refinery Large Boiler/Heater	X			
Peaking Units	X			
Petroleum Refineries			X	
Crude Oil Lightering			X	
State-wide Coal, Residual oil, and Distillate oil Sulfur Limits		X		
RACT on all major primary PM sources				X
Mobile Source Rules				
Federal Non-Road	X	X	X	
Federal On-Road Diesel	X	X	X	
Federal Recreational Marine Gasoline/Diesel Engines	X	X	X	
Federal Commercial/military Marine diesel engines	X	X	X	
Federal Locomotive Rule	X	X	X	
Federal Aircraft emission standards	X	X	X	
Federal Marine vessels, residual oil Rule	X	X	X	
Delaware Anti-Idling Regulation	X	X	X	
OBD in Sussex	X		X	
Federal Ultra-Low Sulfur Fuels	X	X		
Areas Sources				
Delaware Small Stationary Generators (DG) Regulation	X	X		
Federal Small Spark Ignition (Gasoline) Engines Rules	X	X		
AIM (next round)			X	
Consumer Products (next round)			X	
Stage II and ORVR			X	
Cutback Asphalt			X	
Printing & Graphic Arts			X	
Others…..				

95% of DE 2002 VOC Equivalent Emissions (TPD)

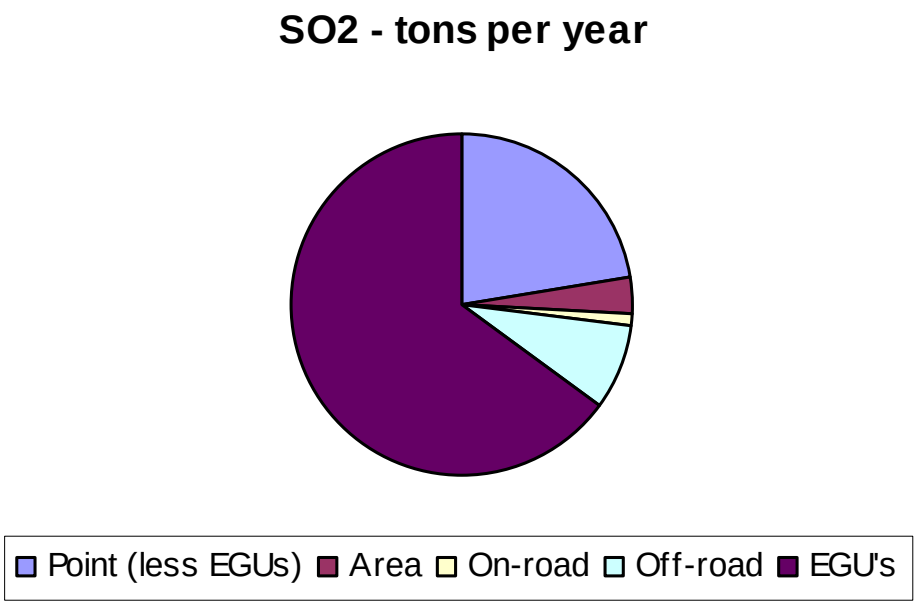


2002 Base Year Emissions - NO_X



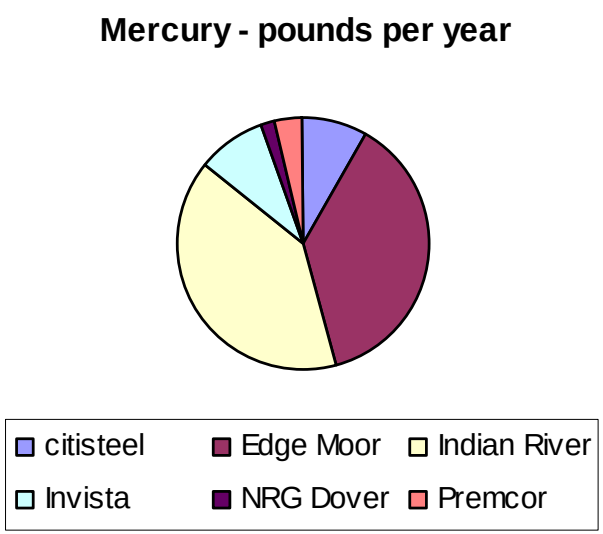
- Delaware's power plants are among the largest NO_X emitting sources in the state.
- In 2002 they accounted for about 55% of the total stationary source NO_X emissions, and about 16% of Delaware's overall NO_X inventory.

2002 Base Year Emissions – SO_2



- Delaware's power plants are the largest SO_2 emitting sources in the state.
- *After the Premcor CD reductions*, they account for about 74% of the total stationary source SO_2 emissions, and about 65% of Delaware's overall SO_2 inventory.

2004 TRI Emissions – Hg



Based on the 2004 TRI data, *after the shutdown of occidental chemical*, ***77%*** of all of the mercury (HG) emissions in Delaware come from Delaware's six coal fired power plants.

Thoughts on Information Presented to Date

Ten Areas:

1. Air Quality
2. Cost
3. Reliability
4. Technology/Timing
5. Clean Air Interstate Rule (CAIR)
6. Clean Air Mercury Rule (CAMR)
7. Form of Standard
8. Other local factors
9. Direct Particulate Matter
10. Generators Proposals

Thoughts on Information Presented to Date

1. Air Quality:
   - Real reductions from current actual emission rates needed
   - Future allowable NO_X, SO_2 and Hg emissions can not exceed current actual levels
2. Cost:
   - Should be reasonable when compared to costs to control other sources.
   - Health costs should be considered. Based on EPA CAIR analysis, health and economic benefits of air pollution reduction outweigh costs by nearly 9:1.

Thoughts on Information Presented to Date

- Deregulated market does not provide for direct cost recovery for Generators
  - Economic viability of individual units should not be a deciding factor.
  - Relative to the age of units, less stringent, interim control measures should only be considered only as a part of enforceable, near-term shutdown commitments.
  - Costs to rate-payers will not be directly passed on to rate-payers as market is deregulated.
  - Future electric rates cannot be estimated

Thoughts on Information Presented to Date

3. Reliability:
   - DNREC should not require any unit to shutdown. Regulation should focus on controls only.
   - Electric demand is increasing at ~2-3% per year
   - New 230kv North-South transmission line.
     - Conectiv Power Delivery is nearing completion of a new 90-mile, north-south 230kV transmission line.
     - The line will run from the Red Lion substation in New Castle County to Milford and the Indian River substation.
     - The line is designed to transport enough electricity to serve about 300,000 customers.
   - PJM is in charge of grid reliability, and is actively pursuing additional major transmission upgrades in DE.

Thoughts on Information Presented to Date

4. Technology/Timing:
   - Reduction targets and timelines should be reasonable and achievable
   - All units should have technology based NO_X, SO_2 and Hg controls
     - SCR is a proven NO_X technology, able to reduce NO_X emissions from all impacted units to 0.1 lb/mmbtu or less.
     - FGD is a proven SO_2 technology, able to reduce SO_2 emissions from all impacted units to 0.18 lb/mmbtu or less.
     - Activated Carbon Injection is a proven Hg technology able to reduce Hg emissions from all impacted units to 0.6 lb/tbtu or less.
   - A phased-in schedule giving adequate time to meet new requirements is necessary.

Thoughts on Information Presented to Date

5) Federal Clean Air Interstate Rule (CAIR):
   - CAIR was designed to mitigate transport
   - CAIR was not designed to solve Delaware's NAAQS and local air quality problems.
   - Multi-P requirements should not interfere with the CAIR program.

6) Federal Clean Air Mercury Rule (CAMR):
   - Studies since CAMR developed show that local mercury emissions impact local area the most.
   - Goal of Regulation is to reduce mercury emissions from DE units
   - CAMR credits should not be used to allow increased Hg emissions in Delaware

Thoughts on Information Presented to Date

7) Form of standard:
   - Specific technology should be left to the sources
   - Rate based requirements alone may not meet goal of regulation:
     - Need actual reductions in mass emissions from current levels.
     - Actual mass reductions plus low historical unit capacity factor would lead to very low allowable emission rates.
     - Setting both long term and short term requirements may be most cost effective.
   - Monitoring based on 40 CFR Part 75 requirements, with modification

Thoughts on Information Presented to Date

8) Other local factors:
   - Requirements should encourage cogeneration, use of otherwise flared fuels, and zero emitting technologies
   - Other impacts should be considered (e.g., water impacts of Wet Scrubbers)

9) Direct Particulate Matter:
   - Total DE $PM_{2.5}$ emissions are 1564 tons per year (about 18% of total $PM_{2.5}$ inventory)
   - All units except McKee Run 3 emit more than 100 TPY.
   - BART and RACT Options:
     - Existing ESPs?
     - Require additional $PM_{2.5}$ control technology?
     - Reg. should prohibit any increase in $PM_{2.5}$ emissions from 2002 levels?
     - Over control of secondary $PM_{2.5}$ versus control of both primary and secondary $PM_{2.5}$?

Thoughts on Information Presented to Date

10) Generators Proposals:
   - Appreciate NRG, Conectiv, and City of Dover's participation to date.
   - NO_X
     - Proposals based on utilization of Low NO_X Burners, overfire air, and SNCR
     - Resultant emission rate approximately 0.2 lb/mmbtu
     - No commitment to hold mass emissions below current levels

Thoughts on Information Presented to Date

- SO_2
  - Proposals based on utilization of sorbet injection/ In-duct scrubber technology, PRB blends, and dry scrubbing.
  - Resultant emission rate approximately 0.5 lb/mmbtu
  - No commitment to hold mass emissions below current levels
- Mercury
  - Co-benefit reductions from existing ESPs, sorbet injection, dry scrubbers
  - Carbon injection as needed, and as commercially available

Proposal: Pollutants Covered

Multi-P Approach:

- Nitrogen Oxides (NO_X). One of the key air pollutants that cause Delaware's ground level ozone problem, and an associated larger regional ozone problem that covers much of the eastern United States.
- Sulfur Dioxide (SO_2). Both NO_X and SO_2 are significant contributors to Delaware's fine particulate matter problem, the associated larger regional fine particulate matter problem and the regional haze problem.
- Mercury (Hg). Hg is a toxic heavy metal, which, when ingested, can cause serious neurological damage, particularly to developing fetuses, infants, and children.

Proposal: Affected Units

Applicability:

- Criteria 1: Coal and Residual oil fired electric utility units
- Criteria 2: Nameplate capacity equal to or greater than 25 megawatts

Unit (year built)	Age	MW/ Fuel	NO_X Controls – Emission data from 2003/4	SO_2 Controls – Current Emission Rate	Mercury Controls – Current Emission Rate
Indian River 1 (1957)	48	82 MW Coal	First generation low NO_X burners & overfire air – **Annual/Ozone Season NO_X 0.36/0.36 lb/mmbtu**	Uncontrolled – **2.03 lb/mmbtu**	ESP Co-benefit
Indian River 2 (1959)	46	82 MW Coal	First generation low NO_X burners & overfire air – **Annual/Ozone Season NO_X 0.35/0.35 lb/mmbtu**	Uncontrolled – **1.94 lb/mmbtu**	ESP Co-benefit
Indian River 3 (1970)	35	177 MW Coal	First generation low NO_X burners, overfire air, & selective non-catalytic reduction – **Annual/Ozone Season NO_X 0.32/0.29 lb/mmbtu**	Uncontrolled – **1.96 lb/mmbtu**	ESP Co-benefit
Indian River 4 (1980)	25	442 MW Coal	First generation low NO_X burners, overfire air, & selective non-catalytic reduction – **Annual/Ozone Season NO_X 0.33/0.30 lb/mmbtu**	< 0.75% S Coal, Tall Stack - **0.98 lb/mmbtu**	ESP Co-benefit
EdgeMoor 3 (1954)	51	84MW Coal	Low NO_X burners, Selective non-catalytic reduction – **Annual/Ozone Season NO_X 0.22/0.17 lb/mmbtu**	< 1% S Coal – **1.01 lb/mmbtu**	ESP Co-benefit
EdgeMoor 4 (1966)	39	154 MW Coal	First generation low NO_X burners, Overfire Air & gas reburn – **0 Annual/Ozone Season NO_X 0.25/0.19 lb/mmbtu**	< 1% S Coal – **1.06 lb/mmbtu**	ESP Co-benefit
EdgeMoor 5 (1973)	32	415 MW Residual Oil	First generation low NO_X burners, Overfire Air – **Annual/Ozone Season NO_X 0.34/0.24 lb/mmbtu**	< 1% S Oil – **0.64 lb/mmbtu**	NA
Mckee Run 3 (1975)	30	114 MW Residual Oil	Burner modifications & Fan Boost Overfire Air – **Annual/Ozone Season NO_X 0.29/0.27 lb/mmbtu**	< 1% S Oil Uncontrolled – **0.74 lb/mmbtu**	NA

Proposal: NO_X Control Requirements

- January 1, 2009:
  - 0.15 lb/MMBTU, 24-hour rolling average
  - NO_X emissions from subject units at a common facility may be averaged on a heat input basis.
- January 1, 2012 and beyond
  - 0.125 lb/MMBTU, 24-hour rolling average
  - No averaging between units.
- Compliance demonstrated with 40 CFR Part 75 CEMs, or other method approved by the Department.

Proposal: SO_2 Control Requirements

- Oil: Beginning January 1, 2009, oil-fired units shall combust only fuel with a sulfur content of 0.5% or less, by weight.

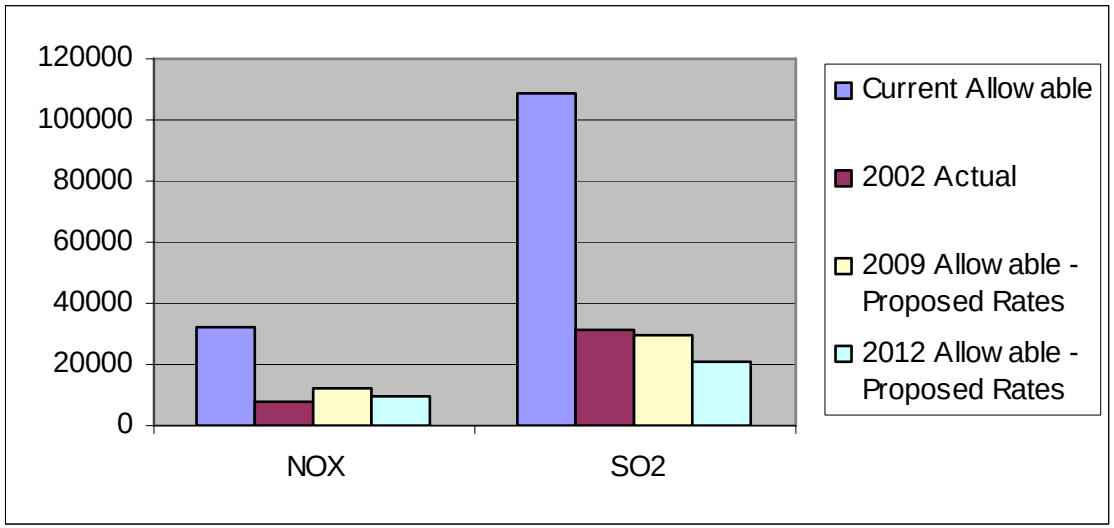
- Coal:
  - January 1, 2009:
    - 0.37 lb/MMBTU heat input, 24-hour rolling average
    - SO_2 Emissions from subject units at a common facility may be averaged on a heat input basis.
  - January 1, 2012 and beyond:
    - 0.26 lb/MMBTU heat input, 24-hour rolling average
    - No averaging between units
  - Compliance demonstrated with 40 CFR Part 75 CEMs, or other method approved by the Department

Proposal: NO_X and SO_2 Control Requirements

- Proposed short-term limits:
  - Ensure all affected units install controls
  - Emission rates are clean relative to highly cost effective technology

- Short term limits alone do not meet goal of Regulation – allowable emissions are not reduced significantly below current levels

Emission Rate Comparison

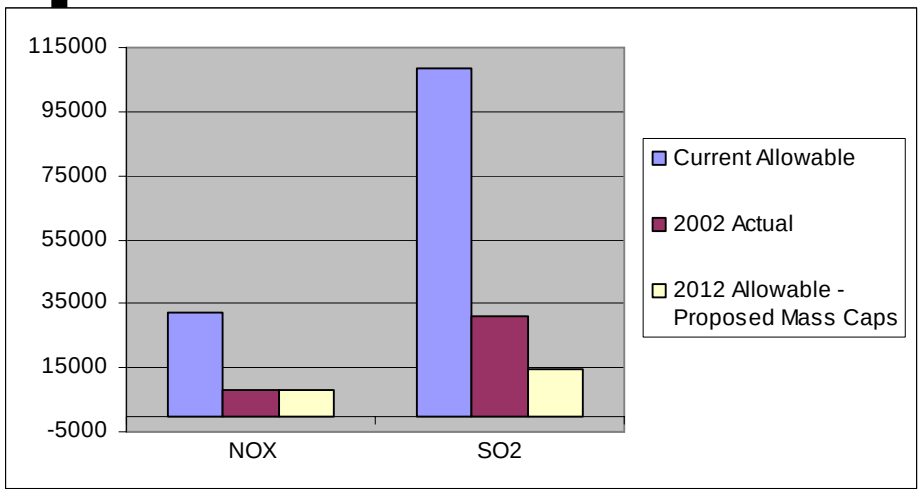


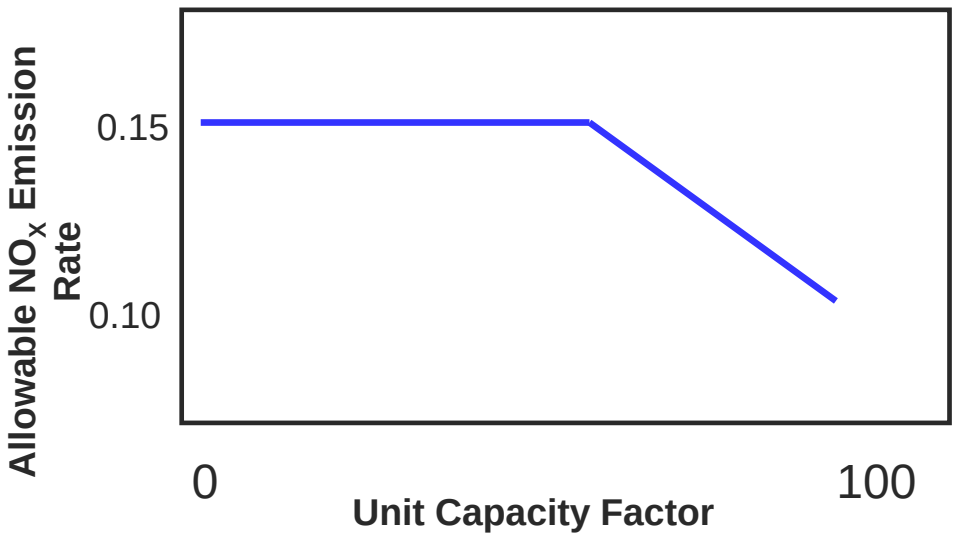
- Capacity factors on coal units projected to increase significantly
- Under proposed short-term limits mass NO_X emissions can increase to greater than current levels
- Under proposed short-term limits mass SO_2 emissions may only decrease marginally compared to current levels

Proposal: NO_X and SO_2 Control Requirements

- In addition to short-term limits, AQM proposal is to set an annual allowable based mass caps based on “retrofit BACT” emission levels:
    - NO_X – cap based on 0.10 lb/mmbtu and 100% capacity factor
    - SO_2 – cap based on 0.18 lb/mmbtu and 100% capacity factor

Emission Rate Comparison





- Short-term limits:
  - •Control at lower capacity factors
  - •60% NO_X and 80% SO_2 reduction in actual emissions from 2002 levels (fleet weighted heat input basis)
- Allowable limits:
  - •NO_X – significant reduction from current allowable, and marginal reduction from current actual levels
  - •SO_2 - significant reduction from both current allowable and actual levels
  - •Mass caps represent a 76% NO_X and 87% SO_2 reduction in allowable emissions
- At higher capacity factors rate reductions are driven by mass caps

Cost/Benefit

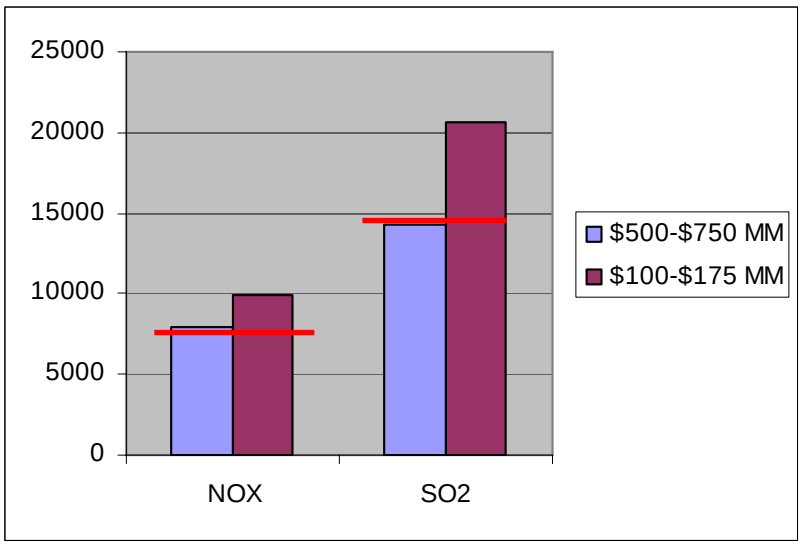
- DNREC Estimate *(based on target emission rates 0.1 lb/MMBTU NO_X, 0.18 lb/MMBTU SO_2, and 0.6 lb/TBTU Hg)*
  - Total capital costs between $500 to $750 million.
  - Between $1,200 and $2,600 per ton of NO_X removed for coal, and between $2,400 and $5,000 per ton for oil units.
  - Between $600 and $1,600 per ton of SO_2 removed for coal, and about $7,000 per ton for the oil units.
  - Between $14,000 and $19,000 per pound of mercury reduced.
- Generation costs:
  - Estimated to increase between $6.72 and $11.21 per mega watt generated for the coal units, and $18.90 to $23.87 for oil units.
  - About 25% increase for both coal and oil.

Cost/Benefit

- DNREC Estimate *(based on target emission rates 0.125 lb/MMBTU NO_X, 0.26 lb/MMBTU SO_2)*
  - Total capital costs between $100 to $175 million.
  - Between $1,200 and $2,500 per ton of NO_X removed for coal, and between $2,400 and $4,500 per ton for oil units.
  - Between $200 and $1,200 per ton of SO_2 removed for coal, and about $7,000 per ton for the oil units.
- Generation costs:
  - Estimated to increase between $4.55 and $9.23 per mega watt generated for the coal units, and $18.50 to $20.75 for oil units.
  - About 20% increase for both coal and oil
- DNREC believes long-term costs are similar, with the trade-off being capital versus operating costs.

Cost/Benefit

Employing both long term and short term requirements should significantly reduce emissions at lower capital cost

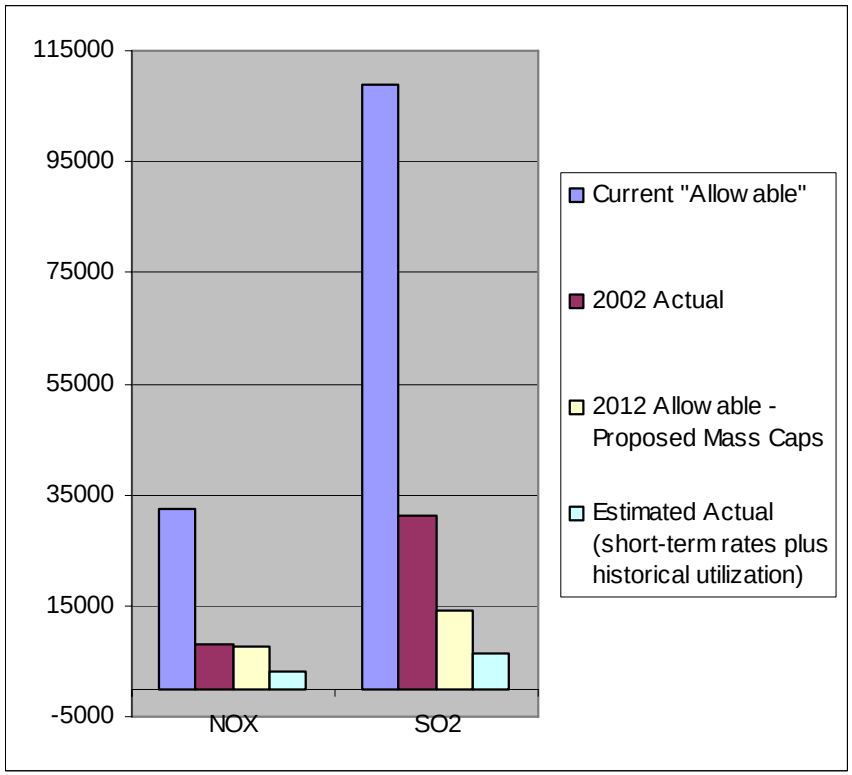


- 0.10 NO_X and 0.18 SO_2
  - Capital cost of 500 to 750 MM
  - Allows up to 7,941 tons of NO_X and 14,294 tons of SO_2.
  - Maximum capital investment only required at higher capacity factors.
- 0.125 NO_X and 0.26 SO_2
  - Capital cost of 100 to 175 MM
  - Significant reduction in actual emission rates from current levels
  - Same allowable mass emissions and emission rate at high capacity factors as 0.10 NO_X/0.18 SO_2 limits
- Similar environmental protection

Cost/Benefit

- Based on a Maryland Department of the Environment (MDE) analysis of the Regulatory Impact Analysis (RIA) EPA performed for CAIR:
  - Maryland estimates its regulations will annually reduce premature mortality by approximately 400 cases, nonfatal heart attacks by approximately 550 cases, chronic bronchitis by 200 cases, acute bronchitis by 500 cases, and hospital admissions and emergency room visits by 600 cases.
  - DE proposed requirements are similar to Maryland's.
  - EPA conservatively estimated that nationally, every $1 spent on power plant controls produces $10 in annual health benefits.
- Summary: DNREC believes target emission rates are achievable and cost effective:
  - 0.1 lb/MMBTU NO_X, 0.18 lb/MMBTU SO_2, and 0.6 lb/TBTU Hg are cost effective; and
  - 0.125 lb/MMBTU NO_X, 0.26 lb/MMBTU SO_2 are highly cost effective.

Summary: Proposed NO_X and SO_2 Control Requirements



NO_X - 0.15 lb/MMBTU, and 0.125 lb/MMBTU, 24-hour rolling average for 2009 and 2012, respectively. Mass cap based on 0.10 lb/mmbtu and 100% capacity factor beginning 2009.

SO_2 – Coal: 0.37 lb/MMBTU, and 0.26 lb/MMBTU, 24-hour rolling average for 2009 and 2012, respectively. Oil: Beginning 2009, sulfur content of 0.5% or less. All: mass cap based on 0.18 lb/mmbtu and 100% capacity factor beginning 2009.

Proposal: Hg Control Requirement

- January 1, 2009:
  - Mercury *emissions* shall not exceed 1.0 lb/TBTU *heat input*, or
  - Be reduced by a minimum 80% capture and control of *inlet mercury*
  - quarterly average basis

- January 1, 2013 and beyond:
  - Mercury *emissions* shall not exceed 0.6 lb/TBTU *heat input*, or
  - Be reduced by a minimum 90% capture and control of *inlet mercury*
  - quarterly average basis

Proposal: Hg Control Requirement

- Annual mass cap to satisfy CAMR:
  - CAMR 2010 Hg cap is 0.072 ton (144 lb, or 2304 oz).
  - CAMR 2018 and beyond cap is 0.028 ton (56 lb or 896 oz).

- Allowable annual unit level mercury mass *emissions* using CAMR allocation methodology:

	2010 – 2017	2018 and Beyond
Edge Moor 3	266 oz	99 oz
Edge Moor 4	462 oz	172 oz
Indian River 1	207 oz	77 oz
Indian River 2	216 oz	81 oz
Indian River 3	337 oz	125 oz
Indian River 4	700 oz	261 oz

- No trading/averaging

Proposal: Hg Control Requirement

- Compliance with mercury emission rate limits demonstrated with 40 CFR Part 75 CEMS.

- Compliance with the percentage reduction of *inlet mercury* provisions shall be demonstrated through quarterly stack tests

Leveling the Playing Field

Pollutant	Delaware Proposed Multi-P Regulation	New Jersey Mercury Rule	MD Clean Power Regulation	Massachusetts	PA Mercury Rule (Draft)	STAPPA/ALAPCO Mercury Model Rule
SO_2	**Short term rates (0.37 lb/MMBTU 2009, 0.26 lb/MMBTU 2012)** **Mass cap (based on 0.18 lb/MMBTU and 100% capacity factor)**	0.15 lb/MMBTU	Mass caps (~0.37 lb/MMBTU 2010, ~0.26 lb/MMBTU 2012)			1.5 lb/MWh or 95% sulfur capture (2013)
NOx	**Short term rates (0.15 lb/MMBTU 2009, 0.125 lb/MMBTU 2012)** **Mass cap (based on 0.1 lb/MMBTU and 100% capacity factor)**	0.1 lb/MMBTU	Mass caps (~0.15 lb/MMBTU 2009, ~0.125 lb/MMBTU 2012)			1.0 - 0.7 lb/MWh (2013)
Mercury	**Short term rates (1.0 lb/TBTU or 80% removal 2009, 0.6 lb/TBTU or 90% removal 2012)** **CAMR mass caps**	3 mg/MWh	23 oz/TBTU (or 80% removal) 2010, 12 oz/MMBTU (or 90% removal) 2013	0.0075 lb/GWh or 85% contorl (2008), 0.0025 lb/GWh or 95% control (2012)	0.024 lb/GWh or 80% control (2010), 0.12 lb/GWh or 90% control (2015)	0.01lb/GWh or 80% capture (2009), 0.006-0.0025 lb/GWh or 90-95% capture (2013)
Particulate	**Being Evaluated**	0.03 lb/MMBTU				0.03 - 0.15 lb/MMBTU (2013)

Proposal: Additional Provisions

- Repowering Incentive
  - Units with enforceable commitments to repower in the near term
  - Alternative interim emission rates

- Otherwise Flared Fuel Credit - emissions that would have been flared may be deducted from actual emissions

Proposal: Additional Provisions

- Combined Heat and Power Credit - thermal output may be subtracted from actual emissions

- Non-emitting Resource Credit - the generating capacity of the simultaneous non-emitting resource may be added to the generating source when calculating its effective emission rate

Related Initiatives

- CAIR will be a separate requirement
  - Multi-P Reg. ensures reductions occur in DE
  - CAIR FIP/SIP to address regional reductions
  - OTC is assisting DE in evaluating need for tighter than CAIR NO_X and SO_2 caps based on regional attainment modeling.

Related Initiatives

- CAMR
  - DE will not participate in CAMR program
  - Multi-P Reg. will be satisfy CAMR requirements
- Regional Haze and Direct $PM_{2.5}$ RACT. Need to consider how to address direct PM emissions further.
- Regional Greenhouse Gas Initiative (RGGI) will be developed under a separate regulation at a later date.

Regulatory Development Timeline

- Public Workshop/Information Sessions: Late July/August 2006
- Proposal: In September 1st 2006 DE Register
- Public Hearing: end of September
- Effective Date: November 11, 2006
- Compliance Date: January 2009/12

Next Meeting

At this time we anticipate holding one or two additional committee meetings to discuss:

- Treatment of particulate matter
- The details of the regulatory language.